Concept: Developmental Biology as Context-Selected Linear Assembly

Idea: Developmental biology may contain systems that are conceptually adjacent to CCSLM: **simple or near-linear mappings, spatially distinct regions, and context signals that determine the local developmental regime**.

- **Linear growth axes**
- Hormone, morphogen, or other developmental signals can form approximately linear or smoothly varying spatial gradients.
- A gradient provides a continuous positional/context coordinate without requiring an explicit coordinate system.

- **Distinct developmental regions**

- Different ranges of a context signal can correspond to different developmental behaviours or local mappings.
- Conceptually:

$$C(x) \to L_1, L_2, L_3, \dots$$

- Thus a continuous developmental axis can address a collection of locally specialized transformations.

- **Regions fitting together**

- Adjacent tissues need not implement the same mapping.
- Instead, neighbouring developmental regimes can be constrained to produce compatible boundaries and continuous structures.
- Complex morphology could therefore emerge from the composition of relatively simple regional processes.

- **Context as control**

- Developmental signals act as a **control pathway**, determining which local process is expressed.
- Cellular state and material being transformed constitute the local data/state pathway.

- **Repeated composition**

- Simple local transformations, repeatedly applied as context changes through space and time, can generate substantial global complexity.
- Complexity therefore need not imply an equally complex local rule everywhere.

Relation to CCSLM

This is **adjacent to CCSLM, not an application of CCSLM to neural networks**.

The common conceptual elements are:

- linear or near-linear mappings,
- multiple distinct regions or regimes,
- context signals selecting or modulating those mappings,
- composition of local transformations,
- separation of **context/control** from the state being transformed.

The biological system need not contain anything resembling a neural network. The interesting question is whether **development can exploit the same general mathematical principle: simple transformations organised by context can produce complex global structure.**